ADJUSTABLE WRENCH

DESCRIPTION

TECHNICAL FIELD

[Para 1]

The present invention relates generally to adjustable wrenches. More particularly, the present invention relates specifically to manually hand operated adjustable wrenches having variable jaw adjustment within a range, for use with a particular size fastener, wherein the wrench jaw is activated to close down and secure upon the fastener for tightening or loosening of the fastener until the adjustable jaw is manually unsecured.

BACKGROUND OF INVENTION

[Para 2]

Manually hand operated adjustable wrenches having variable jaw adjustment within a range, for use with a particular size fastener are old in the art. The most traditional type is typically called a crescent wrench. The design of a crescent wrench includes a movable jaw slide and a guide track that is opposed to a fixed jaw, wherein the movable jaw is adjusted by means of a

worm gear that is supported within the housing that forms an end portion of the adjustable wrench handle. Typically, the worm gear functions as a thumb wheel, wherein rotating the worm gear causes the jaw to move toward and away from the fixed jaw. One issue with the crescent wrench is the speed of adjustment that is attainable, thus to have a higher speed of adjustment with the worm gear and thumb wheel would require a steeper helical angle to be constructed for the cut of the worm gear, however, this steeper angle decreases the ability of the movable jaw to reliably hold a secure position upon the fastener, especially when the fastener is under a high level of force as against movable jaw, in effect causing the worm gear to rotate in a manner to loosen or in other words drive the two jaw faces apart. This results in causing the problem of rounding off of the fastener points which is undesirable and can also cause injury to the user's hand, in that as the wrench slips around the points of the fastener while the user is applying force to the end of the handle furthest from the jaws can result in scraped and cut knuckles. As a practical matter, the steepness of the helical angle of the thumb driven worm gear is about 30 degrees off of a perpendicular axis of rotation for the worm gear.

[Para 3]

Another drawback of the typical traditional crescent wrench, is that in order to adjust the jaws relative to one another the user's hand must move from its advantageous position on the handle which is at the furthest distance from the jaw portion of the handle that results in maximum torque applied from the force of the user's hand, wherein the users hand to adjust the jaws relative to one another must be moved toward the jaw portion of the handle for the user's fingers to engage the worm gear to facilitate jaw adjustment. This requirement of the user having to move their hand on the handle of the wrench can be especially inconvenient when the wrench is being used in a tight or confined space around the fastener.

[Para 4]

Thus, the aforementioned description of a typical crescent wrench has identified three major problems, the first problem being the slow speed of adjustment between the jaws, the second problem being the inconvenience of the user having to reposition their hand on the handle to make the jaw adjustment, and the third problem being the lack of a secure holding of a position of the movable jaw especially while under load from the function of tightening or loosening the fastener causing not only damage to the fastener itself but also potential injury to the user's hand. These three problems have been well recognized in the prior art and the following is a partial summary of some of the solutions that have been put forward in the prior art of manually hand operated adjustable wrenches. One type of adjustable wrench in the prior art utilizes a serrated tooth rack, wherein a pair of separated tooth racks matably engage with one rack on the movable jaw segment and another rack on a spring loaded plunger, wherein the spring urges the racks to matably engage thus securing the movable jaw segment in a particular position relative to the fixed jaw segment. To move the movable jaw segment the plunger is manually pulled back against its urging to disengage the tooth racks, thus allowing the movable jaw segment to freely move.

[Para 5]

One example is given in U.S. Patent No. 1,501,214 to Garrison that discloses a sliding jaw wrench wherein the lower jaw is movable and lockable against an acute angle serrated tooth rack interface with a mating serrated rod or plunger. In Garrison the rod is selectively manually moved by a thumb piece to allow free adjustment of the movable jaw segment, and when in use the user must manually close the immovable jaw segment against the fastener and then simultaneously release the rod for the serrated toothed rack interface to engage thus locking the movable jaw in a secure position. Although Garrison overcomes the problem of the movable jaw not being securely locked in position by virtue of the toothed rack interface, there is a problem in that the movable jaw must be manually positioned by the user's second hand as against the fastener while the users first hand must manually hold the rod

away from the movable jaw segment at the same time, this can be especially difficult in tight or confined areas around the fastener. Another prior art example is in U.S. Patent No. 2,724,301 to Parent et al. that discloses a sliding jaw wrench wherein the lower jaw is movable and lockable against an acute angle serrated rack interface with a mating serrated block that has a rack interface similar to Garrison in structure and function, with the exception that the block axially slides on a pin transverse to the jaw faces.

[Para 6]

Also, U.S. Patent No. 5,152,198 to Schmitz, Jr., disclosed is a snap lock adjustable wrench that utilizes a spring to urge the movable jaw closed and is otherwise similar to Garrison in having an acute angle serrated rack interface between the jaw and the rod, one additional feature is an axially locking threaded knob on the rod to compress the serrated rack interface. Again, U.S. Patent No. 1,523,093 to Wilcox, disclosed is an adjustable sliding jaw wrench that is similar to Garrison in structure and function with the exception of the spring loaded rod being shorter and having two sandwich plates that have their respective serrated racks offset or staggered which is to allow a finer adjustment of the movable jaw. Further, in U.S. Patent No. 1,053,181 to Iring, disclosed is an adjustable wrench utilizing a movable lower jaw with a serrated rack, however, being matably engaged with a parallel positioned serrated rack bar that is mounted on a spring loaded pivot, thus the bar must be manually disengaged by one hand while the movable jaw is selectably positioned by the other hand as in the other prior art examples given in this paragraph. A final prior art example in this area is in U.S. Patent No. 1,397,214 to Hose the discloses a wrench with a mating acute angle serrated rack similar to Wilcox except for the spring loaded rod not being two pieces and the rack being inclined slightly with the stated purpose to allow for a more firm engagement of the mating rack when the jaws are loaded from tightening or loosening of the fastener, in addition the incline acts to allow easier sliding of the mating racks for pushing the movable jaw closed with set screws that can further hold the rod axially.

[Para 7]

None of the aforementioned prior examples address the problem of the speed with which the movable jaw can be placed into its selected position and all require the use of two hands to both manually disengage the rod serrated tooth interface from the movable jaw serrated tooth interface and at the same time requiring the user to manually move the movable jaw into the selected position, consuming both of the user's hands at the same time and causing difficulty where there is a tight or confined space around the fastener.

[Para 8]

Other prior art approaches to the manually adjustable wrench have a higher degree of complexity such as in U.S. Patent Application Publication No. US2002/0112574 A1 to Marks that discloses a slide switch adjustable wrench, allowing through a mechanical linkage adjustment of the movable jaw from the handle portion opposite of the jaw portion thus overcoming the two hands required problem as previously discussed and assisting in the speed of adjustment issue of the movable jaw, however, as Marks still uses the helical thumb wheel to adjust the movable jaw there's still the aforementioned issue of the movable jaw not being secured in a selected position as against the fastener. Another solution is given in U.S. Patent No. 5,375,490 to Carlmark that utilizes an adjustable spanner having a crescent gear segment meshed with a toothed rack on the movable jaw with the disadvantage being, of having to initiate a separate locking device to fix the movable jaw position.

[Para 9]

Also, in U.S. Patent No. 4,454,791 to Seward, III utilized is a geared thumb wheel that mates with a rack gear on the movable jaw, being similar to Carlmark in requiring a separate selectable lock to engage the rack gear of the movable jaw to secure the movable jaw's position. Further, in U.S. Patent No. 3,803,954 to Lenker, a pivoted handle is used having a pinion that engages

the toothed rack movable jaw not having any auxiliary device for locking the movable jaw into a selected position other than the force exerted on the pinion that is that the end portion of the handle upon the movable jaw rack. Finally, in U.S. Patent No. 1,317,546 to Bryant disclosed is an adjustable wrench with a spring loaded thumb pivot that engages and disengages a serrated rack from a slide bolt for locking the movable jaw into a spring loaded position from a lever with the thumb pivot also acting to open the movable jaw by an arm against the lever when the slide bolt is disengaged from the serrated rack operating through a complex linkage, which does allow one-handed operation for setting and locking the movable jaw, however, the adjustable wrench must be held near the jaw portion and not the handle end portion that opposes the jaw for proper and efficient use as previously described.

[Para 10]

What is needed is an adjustable wrench for manual use that only requires one hand operation from the user with the user's hand positioned in its normal location on the wrench handle which is on the end portion opposite of the wrench jaw portion, thus to allow the wrench jaws to be positioned in tight or confined spaces around the fastener and for a way to quickly and easily set the movable jaw into the selected position and have the movable jaw securely locked into the selected position, thus having the added benefit of one handed ratcheting of the fastener.

SUMMARY OF INVENTION

[Para 11]

Broadly, the present invention of an adjustable wrench assembly for loosening or tightening a fastener includes a handle member having a longitudinal axis

spanning between a handle first end portion, a handle central portion, and a handle second end portion. The handle first end portion including a fixed jaw segment, a fixed jaw surface plane, and a transverse axis to the fixed jaw surface plane. The handle first end portion also includes a channel therethrough positioned substantially parallel to the transverse axis, with the handle central portion including a void in communication with the channel, with the void also having a longitudinal axis. Also included is a movable jaw member including a jaw segment, a jaw surface plane, and an engagement portion. The engagement portion is slidably engaged within the channel being operational to move the movable jaw member from an open state to a closed state and from the closed state to the open state. The movable jaw member also includes a serrated toothed rack whose pitch line forms an acute angle in relation to the movable jaw surface plane.

[Para 12]

In addition, included in the adjustable wrench assembly is a beam that has a longitudinal axis, the beam is slidably engaged for reciprocative movement within the void. The beam includes an end portion capable of projecting into the channel, the beam end portion having a serrated toothed rack that selectably matably engages with the movable jaw member serrated toothed rack to help secure the movable jaw member against movement between the closed state and the open state. Finally, included is a trigger member that is pivotally attached to the movable jaw member and is slidably engaged to the handle member. Wherein the trigger is operational to facilitate manual movement of the movable jaw member from the closed state to the open state and from the open state to the closed state when the movable jaw member serrated toothed rack and the beam serrated toothed rack are selectively disengaged.

[Para 13]

These and other objects of the present invention will become more readily appreciated and understood from a consideration of the following detailed

description of the exemplary embodiments of the present invention when taken together with the accompanying drawings, in which;

BRIEF DESCRIPTION OF DRAWINGS

[Para 14]

Figure 1 shows a perspective view of the adjustable wrench assembly with the movable jaw member moved toward the open state;

[Para 15]

Figure 2 shows a side view of the adjustable wrench assembly with the movable jaw member moved toward the open state, with the wrench suspended from a support member through use of a suspension element;

[Para 16]

Figure 3 shows a view of the adjustable wrench assembly from the movable jaw member end;

[Para 17]

Figure 4 shows crossectional cut 4-4 from Figure 3, depicting the broad general interface between the movable jaw member, the beam, the trigger, and the handle member along with the means for urging the beam and the means for urging the movable jaw member;

[Para 18]

Figure 5 shows an expanded view of the broad general interface between the movable jaw member, the beam, the trigger, and the handle member along

with the means for urging the beam and the means for urging the movable jaw member;

[Para 19]

Figure 6 shows an expanded view 6 from Figure 5, showing the movable jaw member, beam, and trigger interface;

[Para 20]

Figure 7 shows a side view of the handle member;

[Para 21]

Figure 8 shows a view of the handle member from the side opposite of the fixed jaw segment;

[Para 22]

Figure 9 shows crossectional cut 9-9 from Figure 8, showing the handle member depicting the void, the fixed jaw segment, and the channel therethrough;

[Para 23]

Figure 10 shows crossectional cut 10-10 from Figure 5, depicting the channel therethrough of the handle member with the slidable engagement of the movable jaw member and the beam;

[Para 24]

Figure 11 shows a perspective view of the movable jaw member;

[Para 25]

Figure 12 shows a perspective view of the beam;

[Para 26]

Figure 13 shows expanded view 13 from Figure 12 with a view of the serrated tooth section of the beam;

[Para 27]

Figure 14 shows a perspective view of the trigger;

[Para 28]

Figure 15 shows a side view of the trigger;

[Para 29]

Figure 16 shows a top view of the trigger; and

[Para 30]

Figure 17 shows an expanded view of the indicia between the movable jaw member and the handle member.

REFERENCE NUMBER IN DRAWINGS

[Para 31]

20 Adjustable Wrench Assembly

[Para 32]

22 Handle member

[Para 33]

24 Handle longitudinal axis

[Para 34]

26 Handle first end portion

[Para 35]

28 Handle central portion

[Para 36]

29 Handle central portion first aperture

[Para 37]

30 Handle second end portion

[Para 38]

31 Handle second end portion aperture

[Para 39]

32 Handle fixed jaw segment

[Para 40]

33 Handle fixed jaw segment jaw surface plane

[Para 41]

34 Fixed jaw surface plane transverse axis

[Para 42]

35 Handle central portion second aperture

[Para 43]

36 Handle first end portion channel therethrough

[Para 44]

37 Handle first end portion channel recess

[Para 45]

38 Handle central portion void

[Para 46]

39 Handle central portion void longitudinal axis

[Para 47]

40 Movable jaw member

[Para 48]

41 Movable jaw member slot void

[Para 49]

42 Movable jaw member jaw segment

[Para 50]

43 Movable jaw member jaw surface plane

[Para 51]

44 Movable jaw member engagement portion

[Para 52]

45 Movable jaw member rib portion

[Para 53]

46 Movable jaw member serrated toothed rack

[Para 54]

47 Means for urging movable jaw member into the open state

[Para 55]

48 Movable jaw member spring element

[Para 56]

49 Serrated toothed rack pitch line

[Para 57]

50 Serrated toothed rack pitch line acute angle

[Para 58]

51 Movable jaw member aperture

[Para 59]

52 Beam

[Para 60]

53 Beam longitudinal axis

[Para 61]

54 Beam serrated toothed rack end portion

[Para 62]

55 Beam non toothed end portion

[Para 63]

56 Beam serrated toothed rack

[Para 64]

57 Beam extension

[Para 65]

58 Beam aperture

[Para 66]

59 Means for urging beam serrated toothed rack 56 to matably engage with movable jaw member serrated toothed rack 46

[Para 67]

60 Beam spring element

[Para 68]

61 Means for manually selectively disengaging the beam serrated toothed rack from the movable jaw member serrated toothed rack

[Para 69]

62 Direction of movable jaw member movement toward the closed state

[Para 70]

64 Direction of movable jaw member movement toward the open state

[Para 71]

65 Beam extension pin

[Para 72]

66 Handle fixed jaw segment indicia

[Para 73]

68 Movable jaw member indicia

[Para 74]

70 Support member

[Para 75]

71 Support element

[Para 76]

75 Trigger member

[Para 77]

76 Movable jaw member spring element retention pin

[Para 78]

77 Trigger slot pin

[Para 79]

78 Movable jaw member spring element retention pin aperture

[Para 80]

79 Trigger pivot pin

[Para 81]

80 Fixed jaw segment surface plane angle to handle longitudinal axis

[Para 82]

81 Trigger slot

[Para 83]

82 Movable jaw member surface plane angle to handle longitudinal axis

[Para 84]

83 Trigger pivot aperture

[Para 85]

84 Opening portion of the reciprocative movement of the beam

[Para 86]

85 Trigger slot pin aperture

[Para 87]

86 Closing portion of the reciprocative movement of the beam

[Para 88]

87 Trigger finger grip

[Para 89]

88 Movable jaw member void

[Para 90]

89 Trigger extension insert

[Para 91]

90 Movable jaw member pin clearance

[Para 92]

91 Trigger body

[Para 93]

94 Trigger movement for movable jaw member movement toward the open state

[Para 94]

96 Trigger movement for movable jaw member movement toward the closed state

[Para 95]

98 Beam longitudinal axis angle to handle longitudinal axis

[Para 96]

102 Beam extension thumb grip

[Para 97]

104 Movable jaw opening force

[Para 98]

106 Reactionary force that is substantially equal and opposite of movable jaw opening force 104

[Para 99]

109 Beam serrated tooth step

[Para 100]

110 Serrated tooth face to step angle

[Para 101]

112 Serrated tooth rack pitch line angle to beam longitudinal axis

[Para 102]

113 Beam serrated tooth face

[Para 103]

114 Serrated tooth face height

[Para 104]

116 Serrated tooth face angle to pitch line

[Para 105]

118 Serrated tooth step angle to pitch line

[Para 106]

120 Movable jaw member serrated tooth step

[Para 107]

122 Movable jaw member serrated tooth face

[Para 108]

124 Serrated toothed rack width

DETAILED DESCRIPTION

[Para 109]

With initial reference to Figure 1 shown is a perspective view of the adjustable wrench assembly 20 with the movable jaw member 40 moved toward the open state, Figure 2 shows a side view of the adjustable wrench assembly 20 with the movable jaw member 40 moved toward the open state, with the wrench 20 suspended from the support member 70 through use of the suspension element 71, and Figure 3 shows a view of the adjustable wrench assembly 20 from the movable jaw member 40 end. Further, Figure 4 shows crossectional cut 4-4 from Figure 3, depicting the broad general interface between the movable jaw member 40, the beam 52, the trigger 75, and the handle member 22 along with the means 59 for urging the beam 52 and the means 47 for urging the movable jaw member 40. Continuing, Figure 5 shows an expanded view of the broad general interface between the movable jaw member 40, the beam 52, the trigger 75, and the handle member 22 along with the means 59 for urging the beam 52 and the means 47 for urging the movable jaw member 40, Figure 6 shows an expanded view 6 from Figure 5, showing the movable

jaw member 40, beam 52, and trigger 75 interface, and Figure 7 shows a side view of the handle member 22. Next, Figure 8 shows a view of the handle member 22 from the side opposite of the fixed jaw segment 32 and Figure 9 shows crossectional cut 9-9 from Figure 8, showing the handle member 22 depicting the void 38, the fixed jaw segment 32, and the channel therethrough 36. Further continuing, Figure 10 shows crossectional cut 10-10 from Figure 5, depicting the channel therethrough 36 of the handle member 22 with the slidable engagement of the movable jaw member 40 and the beam 52, Figure 11 shows a perspective view of the movable jaw member 40, and Figure 12 shows a perspective view of the beam 52. Yet further, Figure 13 shows view 13 from Figure 12, showing an expanded view of the serrated tooth section rack 56 of the beam 52, Figure 14 shows a perspective view of the trigger 75, and Figure 15 shows a side view of the trigger 75. Finally, Figure 16 shows a top view of the trigger 75 and Figure 17 shows an expanded view of the handle member 22 indicia 66 and movable jaw member 40 indicia 68 between the movable jaw member 40 and the handle member 22.

[Para 110]

Broadly the present invention of an adjustable wrench assembly 20 for loosening or tightening a fastener, includes a handle member 22 having a longitudinal axis 24 between a handle first end portion 26, a handle central portion 28, and a handle second end portion 30. The first end portion 26 includes a fixed jaw segment 32, a fixed jaw surface plane 33, and a transverse axis 34 to the fixed jaw surface plane 33. The first end portion 26 also includes a channel 36 therethrough positioned substantially parallel to the transverse axis 34, the central portion also includes a void 38 in communication with the channel 36, with the void 38 having a longitudinal axis 39. More particularly, on the channel 36 and in referring specifically to Figures 9 and 10, the channel 36 includes a recess 37 therethrough that is positioned substantially parallel to the channel 36. The basic handle member 22 is best shown in Figures 7, 8, and 9 as a single piece. The fixed jaw surface plane 33 forms angle 80 with the longitudinal axis 24, with an angle 80 of

preferably about twenty five (25) degrees, however, other angles would be acceptable depending upon the requirements of the adjustable wrench 20 application. More particularly, on the void 38 as best shown in Figures 4 and 9, the void 38 longitudinal axis 39 forms an angle 98 to the handle member longitudinal axis 24 that is preferably about ten (10) degrees, however, angle 98 could be more or less depending upon handle member 22 size, material, beam 52 specifics, and moveable jaw member 40 function, and the like. The preferred materials of construction for the handle member 22 is 416 stainless steel, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 111]

Also included in the adjustable wrench assembly 20 is a movable jaw member 40 including a movable jaw segment 42, a movable jaw surface plane 43, and an engagement portion 44, with the engagement portion 44 being slidably engaged within the channel 36 functioning operationally to move the movable jaw member 40 from an open state to a closed state and from the closed state to the open state. The movable jaw member 40 movement is shown as a direction of the movable jaw member 40 toward the closed state 62 and as a direction of the moveable jaw member 40 toward the open state 64. Wherein the closed state is where the movable jaw member 40 surface plane 43 and the fixed jaw segment surface plane 33 come into contact and the open state is when the movable jaw member 40 surface plane 43 and the fixed jaw segment 32 surface plane 33 are at their furthest separation as best shown in Figure 4. The movable jaw member 40 also includes a serrated toothed rack 46 whose pitch line 49 forms an acute angle 50 in relation to the movable jaw surface plane 43. The movable jaw member 40 is best shown as a single piece in Figure 11. The movable jaw member 40 surface plane 43 forms angle 82 with the longitudinal axis 24, with angle 82 being about twenty five (25) degrees, however, other angles would be acceptable depending upon the requirements of the adjustable wrench 20 application, wherein typically the fixed jaw 32 surface plane 33 and the moveable jaw member 40 surface plane 43 are

typically substantially parallel throughout movement between the closed state and the open state and vice versa. More particularly, on the engagement portion 44 and in referring specifically to Figures 10 and 11, the engagement portion 44 includes a rib portion 45 that slidably engages within the channel recess 37. Wherein the purpose of the slidable engagement between the rib portion 45 and the channel recess 37 is to help movement being denoted as movement 62 toward the closed state and movement 64 toward the open state, of the movable jaw member 40 in the channel 36 to remain substantially along the transverse axis 34 during the application of loading from the fastener as shown by force 104 in Figure 6, or in other words for the fixed jaw 32 surface plane 33 and the moveable jaw member 40 surface plane 43 to remain substantially parallel throughout movement between the closed state and the open state and vice versa. The preferred materials of construction for the moveable jaw member 40 is 416 stainless steel, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 112]

Further included in the adjustable wrench assembly 20 is a beam 52 having a longitudinal axis 53, with the beam 52 being slidably engaged for reciprocative movement within the void 38. The beam 52 includes an end portion 54 capable of projecting into the channel 36, with the beam 52 end portion 54 having a serrated toothed rack 56 that selectively matably engages with the movable jaw member 40 serrated toothed rack 46. Also, the beam 52 includes a non toothed end portion 55 as best shown in Figure 12 that is slidably engaged within the void 38. The serrated toothed rack 56 has a pitch line 49 that forms angle 112 with the beam 52 longitudinal axis 53, wherein the angle 112 is preferably about twenty five (25) degrees, however, angle 112 could be more or less depending upon the amount of force 104, materials used, costs, manufacturing needs, and / or the like dictate in the design. Wherein the beam 52 is operational to help secure the movable jaw member 40 at a selected position between the closed state and the open state when the

beam 52 serrated toothed rack 56 matably engages with the movable jaw member 40 serrated toothed rack 46. The preferred materials of construction for the beam 52 is 416 stainless steel, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 113]

Also included in the adjustable wrench assembly 20 is a trigger member 75 that is pivotally attached to the movable jaw member 40 and slidably engaged to the handle member 22. Wherein the trigger 75 is operational to facilitate manual movement of the movable jaw member 40 from the closed state to the open state and from the open state to the closed state. Further, on the trigger 75 and focusing particularly on Figures 14, 15, and 16, included in the trigger 75 is an extension 89 having an aperture 83, a body 91 with a slot 81, and a finger grip 87. The extension 89 is pivotally attached at the aperture 83 to the movable jaw member 40 and in particular within the movable jaw member 40 slot void 41 at aperture 51 (as best shown in Figure 11 for the movable jaw member 40) utilizing a conventional pin 79 that can be a press fit pin, roll pin, and the like. Continuing on the trigger 75, the slot 81 is slidably engaged to the handle member 22, being disposed within the handle central portion 28 second aperture 35, specifically with the slot 81 retained by a conventional pin 77 that can also be a press fit pin, roll pin, and the like. Wherein the finger grip 87 is operational to facilitate manual movement of the movable jaw member 40 from the closed state to the open state and from the open state to the closed state, in referring to Figure 5 in particular the movement of the trigger 75 and specifically the finger grip 87, movement 94 acts to move the moveable jaw member 40 to the open state and movement 96 acts to move the moveable jaw member 40 to the closed state when the beam 52 serrated toothed rack 56 is selectively disengaged from the movable jaw member 40 serrated toothed rack 46. The preferred materials of construction for the trigger member 75 is a plastic such as DELRIN, other

materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 114]

Optionally, the adjustable wrench assembly 20 can further comprise a means 59 for urging the beam 52 serrated toothed rack 56 to matably engage with the movable jaw member 40 serrated toothed rack 46. Wherein the means 59 also assists in urging the movable jaw member 40 to a selected position moving from the open state to the closed reference movement direction 62, resulting in the movable jaw member 40 in a secured position state upon the fastener as against moving the moveable jaw member 40 toward the open state reference movement direction 64, being operational to allow the adjustable wrench assembly 20 to loosen or tighten the fastener. The means 59 is preferably a beam spring element 60, however, alternatives would be acceptable such as Bellville or wavy springs, resilient elements, and the like.

[Para 115]

In addition, another option for the adjustable wrench assembly 20 is to further comprise a means 47 for urging the movable jaw member 40 toward the open state, being operational to allow the movable jaw member 40 to move to the open state, reference movement direction 64, being accomplished by disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46. The means 47 is preferably a movable jaw member 40 spring element 48, however, also alternatives would be acceptable such as Bellville or wavy springs, resilient elements, and the like. As best shown in Figures 4, 5, 6, 10, and 11 the spring element 48 is disposed within moveable jaw member 40 void 88 and retained by pin 76 in the handle member 22 first end portion 26 adjacent to the channel 36. Note that there is also a pin 76 clearance 90 as best shown in Figure 11 in the moveable jaw member 40. The pin 76 can be a press fit pin, roll pin, and the like.

[Para 116]

Continuing on the adjustable wrench assembly 20 there is an option for a means 61 for manually disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, being operational to facilitate free slidable engagement of the movable jaw member 40 within the channel 36 between the open state and the closed state and vice versa as previously described. More particularly, on the means 61 for manually disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, included is a first aperture 29 in the handle 22 central portion 28 that is in communication with the void 38, wherein the first aperture 29 is positioned substantially parallel lengthwise to the void 38 longitudinal axis 39. Further, on the means 61, the beam 52 includes an extension 57 positioned substantially transverse to the beam 52 longitudinal axis 53, the beam 52 extension 57 is sized and configured to slidably project therethrough the handle 22 central portion 28 first aperture 29 (as best shown in Figures 1, 2, 4, and 5). The extension 57 includes a pin 65 that is received in a beam 52 aperture 58 with a thumb grip 102. Pin 65 can be a press fit pin, roll pin, and the like. Wherein the beam 52 extension 57 is operational to allow manual reciprocative movement of the beam 52 within the void 38, further allowing the beam 52 serrated toothed rack 56 to selectably matably engage with the movable jaw member 40 serrated toothed rack 46 and to selectably disengage the beam 52 serrated toothed rack 56 and the movable jaw member 40 serrated toothed rack 46 from one another. The manual reciprocative movement of the beam 52 within the void 38 utilizing the extension 57 is shown by movement 84 that manually disengages the beam 52 serrated toothed rack 56 and the movable jaw member 40 serrated toothed rack 46 and movement 86 that manually matably engages the beam 52 serrated toothed rack 56 with the movable jaw member 40 serrated toothed rack 46, functioning to help secure the moveable jaw member 40 at a selected position against opening movement 64 to tighten or loosen a fastener.

[Para 117]

More particularly, on the movable jaw member 40 serrated toothed rack 46 and the beam 52 serrated toothed rack 56 that are matingly engagable and share the same pitch line 49 wherein the pitch line 49 angle 50 is an acute angle to the movable jaw member 40 surface plane 43, with the preferred angle 50 being about sixty (60) degrees which acts to assist in closing the movable jaw member 40 toward the closed state, reference movement 62 when the beam 52 moves in the reference direction 86, thus assisting in a "cinching" of the moveable jaw member 40 onto the fastener and with the beam 52 serrated tooth rack 56 matingly engaging the moveable jaw member 40 serrated tooth rack 46 being operational to help secure the moveable jaw member 40 against opening force 104 by reactionary force 106 as shown in Figure 6. Further, to help the mating engagement of the beam 52 serrated tooth rack 56 to the moveable jaw member 40 serrated tooth rack 46, the beam 52 serrated tooth rack 56 face 113 and step 109 have an acute angle 110 relationship as does the moveable jaw member 40 serrated tooth rack 46 face 122 and step 120. The acute angle 110 is preferably about seventy (70) degrees for both the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 as they are matingly engagable, thus having steps 109, 120, faces 113, 122, and angular 110 relations between the steps 109, 120 and faces 113, 122 matched respectively. This acute angle 110 helps facilitate the steps 109, 120 to interlock when the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 are matingly engaged and force 104 is applied when a fastener is tightened or loosened.

[Para 118]

Thus there is not the traditional or conventional separating force associated with conventional meshing gears that are loaded with torque resulting in a tangential gear tooth force that tends to drive the gears apart. The result of the acute angle 110 is to help pull the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 together with the application of force 104 in conjunction with reaction force 106. Further, the beam 52

serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 have angle 118 that is between the steps 109, 120 and the pitch line 49 that is preferably about eighty (80) degrees, resulting in angle 116 preferably being about ten (10) degrees. Also, the face height 114 for both beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 is preferably about thirty thousandths (0.030) of an inch, however, the aforementioned angles and dimensions could be changed as conventional serrated toothed rack design requires based upon the amount of force 104, materials used, costs, manufacturing needs, and / or the like dictate in the design. In addition, the width 124 of both beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46, with the width being defined as transverse to the face height 114 or the pitch line 49 is about one hundred and eighty eight thousandths (0.188) of an inch, however, other sizes would also be allowable being dictated by conventional serrated toothed rack design requirements based upon the amount of force 104, material used, costs, manufacturing needs, and / or the like dictate in the design.

[Para 119]

Continuing further on the wrench assembly 20 an optional aperture 31 can be included that is operational to suspend the handle member from a support member 70, through the use of a suspension element 71, this is allow the wrench assembly 20 to hang from a wall and the like. Additionally, as a convenience to the user the wrench assembly 20 can include on the handle 22 first end portion 26 fixed jaw segment 32 and on the movable jaw member 40, to each have a fastener size indicia visibly disposed on each of the fixed jaw segment indicia 66 and on the movable jaw member 40 indicia 68 to identify the relative fixed jaw segment 32 position to the moveable jaw member 40 position corresponding to a fastener size being preferably english and / or metric units of measure.

[Para 120]

When both the beam 52 spring element 60 and the moveable jaw member 40 spring element 48 are utilized in the adjustable wrench assembly 20, a spring rate relation is desired in that spring element 60 has a higher strength in pounds per inch than the spring element 48 in pounds per inch. The functional purpose is in only having spring element 48 have enough strength in pounds per inch to overcome the weight of the moveable jaw member 40 and the friction of the slidable engagement of the moveable jaw member 40 engagement portion 44 in the handle member 22 channel 36 to facilitate the spring element 48 creating movement 64 of the moveable jaw member 40 to the open state (as previously described) when the beam 52 serrated toothed rack 56 is selectively disengaged from the movable jaw member 40 serrated toothed rack 46. Further, the spring element 60 preferably having a higher pounds per inch rating than the spring element 48 helps to facilitate spring element 60 assisting in urging the movable jaw member 40 in directional movement 62 to a selected position moving from the open state to the closed state resulting in the movable jaw member 40 in a secured position state upon the fastener against moving toward the open state in direction 64, being operational to allow the adjustable wrench assembly 20 to loosen or tighten the fastener. Preferably spring element 60 is constructed of stainless steel wire at a rate of about two and one half (2.5) pounds per inch and spring element 48 is constructed of stainless steel wire at a rate of about one half (0.5) pounds per inch, however, alternate spring types and rates in pounds per inch could be used as design needs dictate.

[Para 121]

As an alternative embodiment of the adjustable wrench assembly 20 for loosening or tightening a fastener, broadly included is a handle member 22 having a longitudinal axis 24 between a handle first end portion 26, a handle central portion 28, and a handle second end portion 30. The first end portion 26 includes a fixed jaw segment 32, a fixed jaw surface plane 33, and a transverse axis 34 to the fixed jaw surface plane 33. The first end portion 26 also includes a channel 36 therethrough positioned substantially parallel to the

transverse axis 34, the central portion also includes a void 38 in communication with the channel 36, with the void 38 having a longitudinal axis 39. More particularly, on the channel 36 and in referring specifically to Figures 9 and 10, the channel 36 includes a recess 37 therethrough that is positioned substantially parallel to the channel 36. The basic handle member 22 is best shown in Figures 7, 8, and 9 as a single piece. The fixed jaw surface plane 33 forms angle 80 with the longitudinal axis 24, with angle 80 being preferably about twenty five (25) degrees, however, other angles would be acceptable depending upon the requirements of the adjustable wrench 20 application. More particularly, on the void 38 as best shown in Figures 4 and 9, the void 38 longitudinal axis 39 forms an angle 98 to the handle member longitudinal axis 24, with angle 98 being preferably about ten (10) degrees, however, angle 98 could be more or less depending upon handle member 22 size, material, beam 52 specifics, and moveable jaw member 40 function, and the like. The preferred materials of construction for the handle member 22 is 416 stainless steel, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 122]

Also included in the alternative embodiment of the adjustable wrench assembly 20, is a movable jaw member 40 including a movable jaw segment 42, a movable jaw surface plane 43, and an engagement portion 44, with the engagement portion 44 being slidably engaged within the channel 36 functioning operationally to move the movable jaw member 40 from an open state to a closed state and from the closed state to the open state. The movable jaw member 40 movement is shown as a direction of the movable jaw member 40 toward the closed state 62 and as a direction of the moveable jaw member 40 toward the open state 64. Wherein the closed state is where the movable jaw member 40 surface plane 43 and the fixed jaw segment surface plane 33 come into contact and the open state is when the movable jaw member 40 surface plane 43 and the fixed jaw segment 32 surface plane 33

are at their furthest separation as best shown in Figure 4. The movable jaw member 40 also includes a serrated toothed rack 46 whose pitch line 49 forms an acute angle 50 in relation to the movable jaw surface plane 43. The movable jaw member 40 is best shown as a single piece in Figure 11. The movable jaw member 40 surface plane 43 forms angle 82 with the longitudinal axis 24, with angle 82 being preferably about twenty five (25) degrees, however, other angles would be acceptable depending upon the requirements of the adjustable wrench 20 application, wherein typically the fixed jaw 32 surface plane 33 and the moveable jaw member 40 surface plane 43 are typically substantially parallel throughout reference movement 64 to the open state and movement 62 to the closed state.

[Para 123]

More particularly, on the engagement portion 44 and in referring specifically to Figures 10 and 11, the engagement portion 44 includes a rib portion 45 that slidably engages within the channel recess 37. Wherein the purpose of the slidable engagement between the rib portion 45 and the channel recess 37 is to help movement being denoted as movement 62 toward the closed state and movement 64 toward the open state, of the movable jaw member 40 in the channel 36 remain substantially along the transverse axis 34 during the application of loading from the fastener as shown by force 104 in Figure 6, or in other words for the fixed jaw 32 surface plane 33 and the moveable jaw member 40 surface plane 43 to remain substantially parallel throughout movement between the closed state and the open state and vice versa. The preferred materials of construction for the moveable jaw member 40 is 416 stainless steel, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 124]

Further included in the alternative embodiment of the adjustable wrench assembly 20 is a beam 52 having a longitudinal axis 53, with the beam 52 being slidably engaged for reciprocative movement within the void 38. The

beam 52 includes an end portion 54 capable of projecting into the channel 36, with the beam 52 end portion 54 having a serrated toothed rack 56 that selectively matably engages with the movable jaw member 40 serrated toothed rack 46. Also, the beam 52 includes a non toothed end portion 55 as best shown in Figure 12 that is slidably engaged within the void 38. The serrated toothed rack 56 has a pitch line 49 that forms angle 112 with the beam 52 longitudinal axis 53, wherein the angle 112 is preferably twenty five (25) degrees, however, angle 112 could be more or less depending upon the amount of force 104, materials used, costs, manufacturing needs, and / or the like dictate in the design. Wherein the beam 52 is operational to help secure the movable jaw member 40 at a selected position between the closed state and the open state when the beam 52 serrated toothed rack 56 matably engages with the movable jaw member 40 serrated toothed rack 46. The preferred materials of construction for the beam 52 is 416 stainless steel, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 125]

Continuing, the alternative embodiment of the adjustable wrench assembly 20 further comprises a means 59 for urging the beam 52 serrated toothed rack 56 to matably engage with the movable jaw member 40 serrated toothed rack 46. Wherein the means 59 assists in urging the movable jaw member 40 to a selected position moving from the open state to the closed state, reference movement 62, resulting in the movable jaw member 40 in a secured position state upon the fastener against moving toward the open state, reference movement 64, being operational to allow the adjustable wrench 20 to loosen or tighten the fastener. The means 59 is preferably a beam spring element 60, however, alternatives would be acceptable such as Bellville or wavy springs, resilient elements, and the like.

[Para 126]

Further, on the alternative embodiment of the adjustable wrench assembly 20 there is a means 61 for manually disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, being operational to facilitate free slidable engagement of the movable jaw member 40 within the channel 36 between the open state and the closed state and vice versa as previously described. More particularly, on the means 61 for manually disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, includes a first aperture 29 in the handle 22 central portion 28 that is in communication with the void 38, wherein the first aperture 29 is positioned substantially parallel lengthwise to the void 38 longitudinal axis 39. Further, on the means 61 the beam 52 includes an extension 57 positioned substantially transverse to the beam 52 longitudinal axis 53, the beam 52 extension 57 is sized and configured to slidably project therethrough the handle 22 central portion 28 first aperture 29 (as best shown in Figures 1, 2, 4, and 5). The extension 57 includes a pin 65 that is received in a beam 52 aperture 58 with a thumb grip 102. Pin 65 can be a press fit pin, roll pin, and the like. Wherein the beam 52 extension 57 is operational to allow manual reciprocative movement of the beam 52 within the void 38 further allowing the beam 52 serrated toothed rack 56 to selectably matably engage with the movable jaw member 40 serrated toothed rack 46 and to selectably disengage the beam 52 serrated toothed rack 56 and the movable jaw member 40 serrated toothed rack 46 from one another. The manual reciprocative movement of the beam 52 within the void 38 utilizing the extension 57 is shown by movement 84 that manually disengages the beam 52 serrated toothed rack 56 and the movable jaw member 40 serrated toothed rack 46 and movement 86 that manually matably engages the beam 52 serrated toothed rack 56 with the movable jaw member 40 serrated toothed rack 46, functioning to help secure the moveable jaw member 40 at a selected position against opening movement 64 to tighten or loosen a fastener.

[Para 127]

Optionally, for the alternative embodiment for the adjustable wrench assembly 20 is a trigger member 75 that is pivotally attached to the movable jaw member 40 and slidably engaged to the handle member 22. Wherein the trigger 75 is operational to facilitate manual movement of the movable jaw member 40 from the closed state to the open state and from the open state to the closed state as previously described. Further, on the trigger 75 and focusing particularly on Figures 14, 15, and 16 included in the trigger 75 is an extension 89 having an aperture 83, a body 91 with a slot 81, and a finger grip 87. The extension 89 is pivotally attached at the aperture 83 to the movable jaw member 40 and in particular the movable jaw member 40 slot void 41 at aperture 51 (as best shown in Figure 11 for the movable jaw member 40) utilizing a conventional pin 79 that can be a press fit pin, roll pin, and the like. Continuing on the trigger 75, the slot 81 is slidably engaged to the handle member 22, being disposed within the handle central portion 28 second aperture 35, with the slot 81 retained by a conventional pin 77 that can be a press fit pin, roll pin, and the like. Wherein the finger grip 87 is operational to facilitate manual movement of the movable jaw member 40 from the closed state to the open state and from the open state to the closed state, in referring to Figure 5 in particular the movement of the trigger 75 and specifically the finger grip 87, movement 94 acts to move the moveable jaw member 40 to the open state, reference movement 64, and movement 96 acts to move the moveable jaw member 40 to the closed state, reference movement 62 when the beam 52 serrated toothed rack 56 is selectively disengaged from the movable jaw member 40 serrated toothed rack 46. The preferred materials of construction for the trigger member 75 is a plastic such as DELRIN, other materials would be acceptable that meet the functional requirements of wrench loading and / or manufacturing / cost considerations.

[Para 128]

In addition, an option for the alternative embodiment of the adjustable wrench assembly 20 is to further comprise a means 47 for urging the movable jaw member 40 toward the open state, reference movement 64, being operational

to allow the movable jaw member 40 to move to the open state by disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46. The means 47 is preferably a movable jaw member 40 spring element 48, however, alternatives would be acceptable such as Bellville or wavy springs, resilient elements, and the like. As best shown in Figures 4, 5, 6, 10, and 11 the spring element 48 is disposed within moveable jaw member 40 void 88 and retained by pin 76 in the handle member 22 first end portion 26 adjacent to the channel 36. Note that there is also a pin 76 clearance 90 as best shown in Figure 11 in the moveable jaw member 40. The pin 76 can be a press fit pin, roll pin, and the like.

[Para 129]

Continuing further on the alternative embodiment of the adjustable wrench assembly 20 an optional aperture 31 can be included that is operational to suspend the handle member from a support member 70, through the use of a suspension element 71, this is allow the wrench assembly 20 to hang from a wall and the like. Additionally, as a convenience to the user, the wrench assembly 20 can include on the handle 22 first end portion 26 fixed jaw segment 32 and on the movable jaw member 40, can each have a fastener size indicia visibly disposed on each of the fixed jaw segment indicia 66 and on the movable jaw member 40 indicia 68 to identify the relative fixed jaw segment 32 position to the moveable jaw member 40 position corresponding to a fastener size being preferably english or metric units of measure.

[Para 130]

Continuing on the alternative embodiment of the adjustable wrench assembly 20 and more particularly on the movable jaw member 40 serrated toothed rack 46 and the beam 52 serrated toothed rack 56 that are matingly engagable and share the same pitch line 49 wherein the pitch line 49 angle 50 is an acute angle to the movable jaw member 40 surface plane 43, with the preferred angle 50 being about sixty (60) degrees which acts to assist in closing the movable jaw member 40 toward the closed state, reference movement 62

when the beam 52 moves in the reference direction 86, thus assisting in a "cinching" of the moveable jaw member 40 onto the fastener and with the beam 52 serrated tooth rack 56 matingly engaging the moveable jaw member 40 serrated tooth rack 46 is operational to help secure the moveable jaw member 40 against opening force 104, reference movement 64, by reactionary force 106 as shown in Figure 6. Further to help the mating engagement of the beam 52 serrated tooth rack 56 to the moveable jaw member 40 serrated tooth rack 46, the beam 52 serrated tooth rack 56 face 113 and step 109 have an acute angle 110 relationship as does the moveable jaw member 40 serrated tooth rack 46 face 122 and step 120. The acute angle 110 is preferably about seventy (70) degrees for both the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 as they are matingly engagable, thus having steps 109, 120, faces 113, 122, and angular 110 relations between the steps 109, 120 and faces 113, 122 matched respectively. This acute angle 110 helps facilitate the steps 109, 120 to interlock when the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 are matingly engaged and force 104 is applied when a fastener is tightened or loosened.

[Para 131]

Thus there is not the traditional or conventional separating force associated with conventional meshing gears that are loaded with torque resulting in a tangential gear tooth force that tends to drive the gears apart. The result of the acute angle 110 is to help pull the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 together with the application of force 104. Further, the beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 have angle 118 that is between the steps 109, 120 and the pitch line 49 that is preferably about eighty (80) degrees, resulting in angle 116 preferably being about ten (10) degrees. Also, the face height 114 for both beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46 is preferably about thirty thousandths (0.030) of an inch, however, the aforementioned angles and dimensions could

be changed as conventional serrated toothed rack design requires based upon the amount of force 104, materials used, costs, manufacturing needs, and / or the like dictate in the design. In addition, the width 124 of both beam 52 serrated tooth rack 56 and the moveable jaw member 40 serrated tooth rack 46, with the width being defined as transverse to the face height 114 or the pitch line 49 is about one hundred and eighty eight thousandths (0.188) of an inch, however, other sizes would also be allowable being dictated by conventional serrated toothed rack design requirements based upon the amount of force 104, material used, costs, manufacturing needs, and / or the like dictate in the design.

[Para 132]

When both the beam 52 spring element 60 and the moveable jaw member 40 spring element 48 are utilized in the alternative embodiment of the adjustable wrench assembly 20, a spring rate relation is desired in that spring element 60 has a higher strength in pounds per inch than the spring element 48 rate in pounds per inch. The functional purpose is in only having spring element 48 have enough strength in pounds per inch to overcome the weight of the moveable jaw member 40 and the friction of the slidable engagement of the moveable jaw member 40 engagement portion 44 in the handle member 22 channel 36 to facilitate the spring element 48 creating movement 64 of the moveable jaw member 40 to the open state (as previously described) when the beam 52 serrated toothed rack 56 is selectively disengaged from the movable jaw member 40 serrated toothed rack 46. Further, the spring element 60 preferably having a higher pounds per inch rating than the spring element 48 helps to facilitate spring element 60 assisting in urging the movable jaw member 40 in directional movement 62 to a selected position moving from the open state to the closed state resulting in the movable jaw member 40 in a secured position state upon the fastener against moving toward the open state in direction 64, being operational to allow the adjustable wrench assembly 20 to loosen or tighten the fastener. Preferably spring element 60 is constructed of stainless steel wire at a rate of about two and one half (2.5) pounds per inch

and spring element 48 is constructed of stainless steel wire at a rate of about one half (0.5) pounds per inch, however, alternate spring types and rates in pounds per inch could be used as design needs dictate.

METHOD OF USE

[Para 133]

Referring to Figures 1, 2, 3, 4, 5, and 17 a method of using the adjustable wrench assembly 20 for loosening or tightening a fastener, comprises the steps of, first providing an adjustable wrench assembly 20. The adjustable wrench assembly 20 includes a handle member 22 with a fixed jaw segment 32, a movable jaw member 40 with a serrated toothed rack 46, a beam 52 with a serrated toothed rack 56, a means 59 for urging the beam 52 serrated toothed rack 56 to matably engage with the movable jaw member 40 serrated toothed rack 46. Wherein the movable jaw member 40 is assisted in urging toward a closed state and secured position state upon the fastener against moving toward the open state by the means 59. Also included in the adjustable wrench assembly 20 is a means 61 for manually selectively disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, and a trigger member 75 pivotally attached to the movable jaw member 40 and slidably engaged to the handle member 22. The trigger member 75 facilitating manual movement of the movable jaw member 40 from the closed state to the open state and from the open state to the closed state when the beam 52 serrated toothed rack 56 is selectively disengaged from the movable jaw member 40 serrated toothed rack 46.

[Para 134]

Further, a next step is in manually grasping the handle member 22 of the adjustable wrench assembly 20 and then a step of moving and holding the means 61 for manually selectively disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46. Continuing, the next step is in moving the trigger member 75 as shown by trigger member 75 movement 94 to open 64 the movable jaw member 40 and by trigger member 75 movement 96 to close 62 the moveable jaw member 40 facilitating a selective positioning the movable jaw member 40 between the closed state and the open state, wherein the further step of positioning the fixed jaw segment 32 and the movable jaw member 40 on the fastener is completed.

[Para 135]

Once the positioning the fixed jaw segment 32 and the movable jaw member 40 on the fastener is completed, a subsequent step is in releasing the means 61 for manually disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, thus allowing the means 59 for urging the beam 52 serrated toothed rack 56 to matably engage with the movable jaw member 40 serrated toothed rack 46, resulting in the movable jaw member 40 being in a substantially secured position state upon the fastener, with the moveable jaw member 40 resisting movement 64 toward the open state. Finally, a step of applying manual force to the handle member 22 that is operational to loosen or tighten the fastener as is well known in the art.

[Para 136]

Optionally, an additional step of combining the following steps of; (c) moving and holding the means 61 for manually selectively disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46. Continuing, the next step (d) is in moving the trigger member 75 as shown by trigger member 75 movement 94 to open 64 the movable jaw member 40 and by trigger member 75 movement 96 to close 62 the moveable jaw member 40 facilitating a selective positioning the movable jaw member 40

between the closed state and the open state, wherein the further step (e) of positioning the fixed jaw segment 32 and the movable jaw member 40 on the fastener is completed. Once the positioning the fixed jaw segment 32 and the movable jaw member 40 on the fastener is completed, a subsequent step (f) is in releasing the means 61 for manually disengaging the beam 52 serrated toothed rack 56 from the movable jaw member 40 serrated toothed rack 46, thus allowing the means 59 for urging the beam 52 serrated toothed rack 56 to matably engage with the movable jaw member 40 serrated toothed rack 46, resulting in the movable jaw member 40 being in a substantially secured position state upon the fastener, with the moveable jaw member 40 resisting movement 64 toward the open state. Finally, the step (g) of applying manual force to the handle member 22 that is operational to loosen or tighten the fastener as is well known in the art. With the aforementioned steps (c), (d), (e), (f), and (g) being sequentially repeated to provide for a ratcheting action of the adjustable wrench assembly 20 to loosen or tighten the fastener.

CONCLUSION

[Para 137]

Accordingly, the present invention of an adjustable wrench assembly has been described with some degree of particularity directed to the embodiments of the present invention. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so modifications the changes may be made to the exemplary embodiments of the present invention without departing from the inventive concepts contained therein.